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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/708,035	02/04/2004	Laertis Economikos	FIS920030391	2034
30449 7590 01/25/2008 SCHMEISER, OLSEN & WATTS 22 CENTURY HILL DRIVE SUITE 302 LATHAM, NY 12110			EXAMINER VU, DAVID	
			ART UNIT 2818	PAPER NUMBER
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No. 10/708,035	Applicant(s) ECONOMIKOS ET AL.	
	Examiner DAVID VU	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 11/07/07.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 11, 13 and 15-30 is/are pending in the application.
- 4a) Of the above claim(s) 1-10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 11, 13 and 15-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 11, 13, 18, 25 and 26 are rejected under 35 U. S. C. 102(b) as being anticipated by Spikes et al. (US Pat. 5,981,354, hereinafter Spikes).

Spikes in figs. 4-8 disclose a method of fabricating a filled trench structure, comprising:

(a) forming a planarization stop layer 114 on a top surface of a substrate 110 (fig. 4);

(b) forming a first set of trenches (narrow trenches 126), in a first region of planarization stop layer and substrate and forming a second set of trenches (wide trenches 124) in a second region of planarization stop layer and substrate, trenches in first set of trenches (wide trenches 126) having a higher aspect ratio than trenches in second region (wide trenches 124) (fig. 5);

(c) depositing a layer of a fill material 140 in and over first and second sets of trenches and on a top surface of planarization stop layer, fill material completely filling each trench of first set of trenches and completely filling each trench of second sets of trenches, a first thickness d3 of layer of fill material 138 directly over each trench of first

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set of trenches 126 greater than a second thickness d2 of layer of fill material 138 directly over each trench of second set of trenches 124, first and second thicknesses measured perpendicularly from a plane coplanar with top surface of planarization stop layer 120 to a top surface of layer of fill material 140 (col. 5, line 60 through col. 6, line 12 and fig. 6);

(d) after (c), non-selectively removing, using a non-planarization process/etchback process, an entire uppermost layer of fill material from over first and second regions and top surface of planarization stop layer to form a thinned layer of fill material remaining over first and second regions and on top surface of planarization stop layer (col. 6, lines 40-42 and 46-47), fill material still completely filling each trench of first set of trenches and each trench of second set of trenches; and

(e) after (d), removing, using a planarization process (col. 6, lines 46-60 and fig. 8), all thinned layer of fill material 138 from top surface of planarization stop layer 114 and over first and second region, fill material 138 still completely filling each trench of first set of trenches and each trench of second set of trenches, a top surface of fill material in first set of trenches and a top surface of fill material in second sets of trenches co-planer with top surface of planarization stop layer 114.

2. Claims 11, 13, 14 and 17-24 are rejected under 35 U. S. C. 102(b) as being anticipated by Karlsson et al. (US Pat. 6,124,183, hereinafter Karlsson).

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Karlsson in figs. 2D-2J disclose a method of fabricating a filled trench structure, comprising:

- (a) forming a planarization stop layer 203 on a top surface of a substrate (fig. 2D);
- (b) forming a first set of trenches 205 in a first region of planarization stop layer and substrate and forming a second set of trenches 206 in a second region of planarization stop layer and substrate, trenches in first set of trenches having a higher aspect ratio than trenches in second region (fig. 2E);
- (c) depositing a layer of a fill material 208 in and over first and second sets of trenches and on a top surface of planarization stop layer, fill material completely filling each trench of first set of trenches and completely filling each trench of second sets of trenches (fig. 2F), a first thickness of layer of fill material directly over each trench of first set of trenches is inherently greater than a second thickness of layer of fill material directly over each trench of second set of trenches 124 (see Spikes; col. 5, line 64 through col. 6, line 12);
- (d), after (c):
  - (i) forming a mask layer 210 on fill material 208;
  - (ii) forming a opening in mask layer in first region and over trenches of said first set of trenches (fig. 2H);

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(iii) removing a layer of fill material exposed in opening, fill material still completely filling each trench of said first set of trenches (col. 5, line 54-60 and fig. 2I); and

(iv) removing masking layer (col. 5, line 60); and

(e) after step (d), removing, using a planarization process (fig. 2J and col. 5, lines 60-65), all of fill material from top surface of planarization stop layer and over first and second set region, fill material still completely filling each trench of first set of trenches and each trench of second set of trenches, a top surface of fill material in first set of trenches and a top surface of fill material in second sets of trenches co-planer with top surface of planarization stop layer.

### **Claim Rejections - 35 USC § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 15 and 16 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Spikes et al. (US Pat. 5,981,354).

Spikes fails to disclose the fill material is removed about 5 to 20% of the as deposited thickness (claim 15); and the aspect ratio of the first/second trenches (claim 16). It would have been obvious to one with ordinary skill in the art at the time of the invention to perform an etched back process step as taught by Spikes. The amount of the fill material being etched and the aspect ratio of the first/second trenches does not define patentable over Spikes since it is well known processing variable and the discovery of the optimum or workable range involves only routine skill in the art. The specific amount of the semiconductor being etched does not provide any critical or unexpected results to the method of manufacturing a semiconductor device. Rather, it is merely an obvious selection of the etching amount based on desired functional characteristics determinable by routine experimentation. In *Aller*, the court stated, "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456 105 USPQ 233,235 (CCPA 1995).

4. Claims 15, 16, 20 and 28 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Karlsson (US Pat. 6,124,183).

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Karlsson fails to disclose the fill material is removed about 5 to 20% of the as deposited thickness (claims 15&20); and the aspect ratio of the first/second trenches (claims 16&28). It would have been obvious to one with ordinary skill in the art at the time of the invention to perform an etched back process step as taught by Karlsson. The amount of the fill material being etched and the aspect ratio of the first/second trenches does not define patentable over Karlsson since it is well known processing variable and the discovery of the optimum or workable range involves only routine skill in the art. The specific amount of the semiconductor being etched does not provide any critical or unexpected results to the method of manufacturing a semiconductor device. Rather, it is merely an obvious selection of the etching amount based on desired functional characteristics determinable by routine experimentation. In *Aller*, the court stated, "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456 105 USPQ 233,235 (CCPA 1995).

### **Response to Arguments**

5. Applicant's arguments with respect to claims 11, 13 and 25-24 have been considered but are moot in view of the new ground(s) of rejection.

### **Conclusion**

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6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The art cited on the *Notice of References* is included as teaching the general state of the art relating to the instant invention.

US Pat. 7,078,314 (Kim et al.) is cited as teaching a memory device having a periphery isolation region and core isolation region. A core trench having an aspect ratio of approximately 7.0-8.0 or more and a periphery isolation trench having an aspect ratio of approximately 7.0-8.0 or less (col. 13, lines 12-13 and lines 56-57).

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Vu whose telephone number is (571) 272-1798. The examiner can normally be reached on Monday-Friday from 8:00am to 5:00pm. If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Loke H can

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be reached on (571) 272-1657. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR, Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



DAVID VU  
PRIMARY EXAMINER